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ABSTRACT

Initially, many children use language with enthusiasm and apparent ease, but this lively use of language is sharply curtailed shortly after they begin school. This can be attributed to teachers' monopolizing continued discourse. A study explored the idea that increased student oral participation by more students at a higher level of thinking would result during problem solving discussions of children's literature if language arts teachers were trained in wait-time theory (analysis of pauses occurring between teacher and student interaction), in higher level questioning strategies, or both. Data were gathered from third, fourth, and fifth grade students and teachers in 20 elementary classrooms. Results showed those teachers trained in wait-time techniques had longer student responses, asked more higher level questions, but asked fewer total questions. A somewhat complementary pattern was observed for higher level questioning training. Those who were trained experienced greater numbers of alternative student explanations and more higher level student responses. Neither, however, increased the total number of teacher questions. Results support the contention that questioning research needs to address itself to both the effects of a variety of questions and the other variables that comprise the learning situation. (HOD)

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A Successful Transplant of Wait-Time and Questioning Strategies to Children's Oral Language Behaviors

Interaction Patterns and Learning: A Rationale

The desire to communicate is a continuous self-fulfilling activity. Initially, many children use their language with enthusiasm and apparent ease, but this lively use of language is sharply curtailed shortly after their arrival into the school's educational setting. Dewey recognized the children's limited participation in school during question-and-answer sessions or during class discussions. He attributed this condition to the "teacher's habit of monopolizing continued discourse" (Dewey, 1933). The unfavorable picture of classroom interaction that Dewey expressed was later documented in studies on classroom interaction by Withall (1949), Flanders (1960), Bellack et al. (1966), and others. It has been shown that teacher talk dominates 65 to 75 percent of the lecture-recitation mode of teaching (Flanders & Simon, 1969). However, studies on classroom interaction have indicated that a higher level of learning occurs in student centered classrooms with less "teacher talk." In spite of

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the research on classroom interaction, the ratio of teacher talk to student talk is three to one (Bellack, et al., 1966). Herber believes this situation exists because teachers "still apply old methods to new materials" (1970). According to Joyce and Harootunian, "the contemporary explosion of knowledge...has effectively put an end to the notion that the teacher's primary role is to be a single source of facts and knowledge" (1967). Dewey stated in 1933 that "learning is [an] active" endeavor with the teacher assuming the role of facilitator guiding the student to question, experience, organize, classify and test hypotheses about his world. Bruner (1969) expressed similar views of learning in The Process of Education where "learning how to learn" was to be considered the foundation of education. Problem solving was to be the replacement for drill and memory learning in the schools.

Since 1960, when Bruner expressed his philosophy of learning, much has been written about the theory and methodology of problem solving in the content areas of science (Rowe, 1973), social studies (Banks, 1973), and the language arts (Lundsteen, 1976), along with the accompanying variables of questioning techniques (Sanders, 1966), group processes (Schmuck & Schmuck, 1975), classroom climate, teacher role, and teacher effects (Flanders, 1970). Yet research reports continue to indicate that the recitation method is still the dominant mode of instruction with teacher questions comprising a high percentage of the already 70 percent recorded as teacher talk during the school day (Rowe, 1974). A rapid-fire questioning pattern at memory-recall level has been documented by researchers from the beginning of the twentieth century and the pattern has not changed over the years (Flanders, 1963; Gall, 1970; Stevens, 1912; Yamada, 1913). Teacher questions structure the levels of thinking of our students (Taba & Elzey, 1964; Hunkins, 1968; Garris, 1974; Aschner, 1961). However, the kinds of questions asked during these rapid-fire

questions and answer sessions do not lift, but rather suppress both higher level student thinking and active student participation.

Wait-Time

In research studies completed by Rowe, another link between the level of teacher questions and the level of student thinking was discovered and analyzed: wait-time. After six years of empirical study, Rowe identified wait-time as another variable that effects student participation in problem solving and discussions. In inquiry-oriented science lessons, two kinds of pauses were recognized. The pauses were labeled wait-time I and II. The former is the pause that occurs after a teacher question and before a student response. The latter is the pause that occurs after a student response and before a teacher normally reacts or asks another question.

It was found that the mean wait-time for I is less than one second before the teacher would repeat, rephrase, or ask another question or call on another student. The average wait-time for II is nine-tenths of a second before a teacher normally reacts to the student statement or asks another question (Rowe, 1973). After a teacher training period when wait-time I and II increased by at least three to five seconds, positive effects occurred for both students and teachers alike. The following gains were reported by Rowe with increased wait-time of three to five seconds.

Effects on students were: (1) the length of students' responses increased, (2) the number of unsolicited but appropriate responses by students increased, (3) failures to respond decreased, (4) confidence, as reflected in fewer inflected responses, increased, (5) the incidence of speculative thinking increased, (6) teacher centered show-and-tell decreased and child-to-child comparing increased, (7) more evidence followed by or preceded by

inference statements was given, (8) the number of questions asked by children increased and the number of experiments they proposed increased, (9) contributions by "slow" students increased, and (10) disciplinary moves decreased.

Effects on teachers were: (1) teachers' responses exhibit greater flexibility as indicated by the occurrence of fewer discourse errors, (2) the number and kind of questions by the teacher change, and (3) teachers' expectations for the performance of certain children seem to change.

Rowe's theory on wait-time would seem to alter favorably the interaction patterns of problem solving discussions so that more student oral participation and less teacher talk can be achieved. The variable of wait-time is present during problem solving discussions which can be either a motivator or an inhibitor of students' oral participation. The positive effects of this variable have been demonstrated by Rowe (1974) in over 800 science lessons.

Rowe's wait-time theory quantifies and qualifies pauses. From the studies on classroom interaction reported by Rowe and others, it is clear that teacher talk far surpasses student talk.

Implementation of Wait-Time

Wait-time is but one of many variables that would help to increase the success of problem solving discussions. Other variables, such as group processes (Schmuck & Schmuck, 1975) problem solving (Getzels, 1964) questioning techniques (Sanders, 1966) and student centered climate (Amidon & Hough, 1967), have been analyzed and written about in length. However, in order to reverse the high percentage of teacher talk and low percentage of student participation in problem solving discussion, teachers need to develop lessons with those techniques that will hield the highest gains in student participation. It is

especially important to the language arts teacher to utilize the most productive methodologies since "the language arts are the foundation of the school curriculum" (Petty, et al., 1973). It is from language that learning is handed down, ideas are shared, and discussions are generated.

From a search of the current literature, teachers are given an abundance of information on strategies to employ in order to develop a positive discussion from start to finish. They all stress the importance of increased student talk, skills or problem solving, questioning techniques, classroom climate, and some even stress the facilitating teacher's role. One article only brought out wait-time, but it did so without reference to Rowe's theory and without any specific instructions for classroom usage (Fisher & Lyons, 1974). In light of Rowe's findings on classroom interaction, it would seem that even the most positive implementation of these variables without the use of wait-time would lessen the teacher's chances to fulfill the objectives of a problem solving discussion.

To most teachers, wait-time (extended pause) is considered a threat to the student's sense of security. Rowe turned this consideration around stating that the students' sense of security and self-worth are diminished each time a teacher denies them the necessary time (wait-time) to collect their thoughts and present them intelligently.

Classroom pauses have been recognized for some time as evident by their presence under the category "silence" on classroom observation scales of Flanders (1970) and Hough (1967). However, Rowe went beyond recognition of both by quantifying and qualifying student pauses. From her study, teachers can more knowledgeably deal with pauses, not only by recognizing their occurrence, but also by manipulating them intelligently to the advantage of students.

Statement of the Problem

The intent of this study was to explore the idea that increased student oral participation by more students at a higher level of thinking would result during problem solving discussions of children's literature when language arts teachers were trained in Rowe's wait-time (WT) theory, in higher level questioning strategies (HLQ), or both (WTHLQ).

The teacher and student outcomes achieved in science are equally desirable in problem solving discussions in language arts. The hypothesis proposed is that language arts teachers would be better able to achieve their goals during problem solving discussions if they were aware of the variable wait-time and its respective outcomes.

This study attempted to replicate Rowe's procedure on wait-time in the subject area of the language arts during problem solving discussions of children's literature. After instructing the teachers on language patterns to avoid wait-time and levels of questioning, students' oral participation in discussions should increase with the following outcomes: (1) longer student responses, (2) greater number of alternatives and/or solutions by students, and (3) higher level of thinking in students responses (Rowe, 1974). Expected teacher outcomes are as follows: (1) greater variety of teacher questions, (2) fewer teacher questions, and (3) fewer disciplinary moves by the teacher (Rowe, 1974). The student and teacher outcomes which were unique to the area of science as well as those outcomes which required elaborate equipment to measure were not considered to be within the limits of this study.

Procedures

Research Design

The field experiment conducted in this study was based on Post-Test Only Control Group Design 6, developed by Campbell and Stanley (1963). The following four treatment groups create a 2x2 factorial design: (1) wait-time and higher level questioning training (WT+HLQ), (2) higher level questioning training only (HLQ), (3) wait-time training only (WT), and (4) control (no training) (see Figure 1).

Higher Level Questions	Wait-Time	
	Trained	Not Trained
Trained	WT+HLQ (Cell 1)	HLQ only (Cell 2)
Not Trained	WT only (Cell 3)	Control (Cell 4)

Figure 1. Four cells formed by two levels each of two independent variables.

Criterion Variables

The six criterion variables examined in this study include: (1) length of student responses, (2) alternate student explanations, (3) higher level student responses, (4) higher level teacher questions, (5) teacher questions, and (6) disciplinary moves.

Sample

Data were gathered in twenty elementary Catholic classrooms in the District of Columbia and Arlington, Virginia, during the 1979 school year.

Third, fourth, and fifth grade students and their teachers who volunteered were selected from mainly self-contained classrooms. The intent was to eliminate any probable effects from a variety of teachers' influences, and as a consequence, reduce possible contamination of the sample by such effects. The twenty teachers in the study were all females, including three who were in the religious teaching order.

The sample geographic areas are considered to have a highly mobile population due to the fact that most are government employees and affected by the election process. The sample of students in the study can best be described as a mix of cultures, in addition to whites and blacks. There were two black teachers, one Philipino teacher, and the remaining seventeen teachers were white. Predomiately, the sample's socioeconomic level was middle class. The students in the sample were heterogeneously grouped.

Instrumentation

In order to uniformly record the findings of the data gathering from the six follow-up children's literature discussions, two coding devices were utilized. The Searles' (1970) Cognitive Operation Index was used to code the level of teacher questions and the level of student thinking according to Taba's definitions of "thought units" (Taba & Elzey, 1964). Rowe's definitions of wait-time I and II served as the basis for recording the number and length of wait-time I and II employed by the teachers and the students. The raw data were coded for the six follow-up discussions in the two different modes on a separate basis by the three raters independent of each other.

Treatment Conditions

The seven schools were randomly assigned to one of the four treatment groups by using a table of random numbers. Five teachers were in each treatment

group and the number of schools and number of students per treatment group were as follows: (1) Cell 1--the wait-time and questioning group, one school with 100 students, (2) Cell 2--the wait-time group, two schools with 146 students, (3) Cell 3--the questioning group, two schools with 122 students, and (4) Cell 4--the control group, two schools with 123 students.

The teachers were asked to hold ten to fifteen minute follow-up discussions for each of the seven children's literature stories. The seven stories were made into slide/tape presentations in order to insure consistent use of the stimulus. The slide/tape story set that was used initially in the classroom was considered by the investigator and the teachers as a "trial run" to familiarize teachers and students with the equipment and materials. It should be noted that each group, during the training session, utilized a cassette tape recorder to tape the follow-up discussions of the children's literature training stories. The teachers were instructed to call on whomever they wanted whether their hand was raised or not during the follow-up discussions.

Teachers in the questioning treatment were directed to ask a variety of questions from memory to evaluation with a greater number at the higher levels of thinking. Teachers in the wait-time treatment were directed to employ both wait-time I and II, whether the students utilized the additional time or not. Those teachers in the control group were directed to provide a follow-up discussion for each slide/tape set as they normally would with their classes.

Method of Data Analysis

In accordance with the procedures developed by Withall (1949), the investigator and two raters coded a minimum of 50 to 100 tallies of thought units for each teacher over the six follow-up discussions which would provide

between 20 to 30 total hours, or seven and one-half hours per group. The reliability among the three raters during the training was established at +.85 percent or better. Therefore, due to the high percentage of inter-rater reliability, an average score for each dependent variable was used, not the individual rater's raw scores when computing ANOVA and the t-test scores at the .05 level of significance. The follow-up t-test scores were employed to determine cell to cell interaction.

For data gathering on each measure in this study, the follow-up discussions were utilized in their entirety. The average length of the follow-up discussions was twelve minutes for the twenty teachers in the study. In order to equalize the differences in the amount of data obtained from each taped follow-up discussion, all dependent variables except student response length were calculated on a per minute basis. The data for the dependent variable student response length was calculated on a seconds per response basis. Therefore, longer or shorter follow-up discussions were able to be treated in an identical manner.

As a validity check, ten follow-up discussions were coded live by this researcher with the permission of each teacher. This procedure allowed a validity check between what was heard during live and taped coding of the follow-up discussions. The live coding occurred only after two slide/tape sets had been used by each teacher.

Findings

Hypothesis One

1. An increase in the average length of students' responses is not related to the amount of use the teacher has made of wait-time (WT) training.

2. An increase in the average length of students' responses is not related to the amount of use the teacher has made of higher level questioning (HLQ) training.

3. There will be no significant interaction between wait-time and higher level questioning (WT+HLQ) training on the criterion of the length of student responses.

The dependent variable determining the significance of Hypothesis One was average length of students' responses. It was determined for the independent variable wait-time (WT) that a significant effect was found, $F(1,17)=12.9$, $p < .05$ (see Table 1).

Table 1
Analysis of Variance Summary for the Criterion:
Length of Students' Responses

Source	Sums of Squares	Degrees of Freedom	Mean Squares	F
WT	448.97	1	448.97	12.89*
HLQ	.91	1	.91	.03
WT+HLQ	6.48	1	6.48	.19
Error	592.12	17	34.83	-
Total	1048.48	19	-	-

*$p < .05$.

Students of teachers who use longer wait-time had longer responses than students of teachers who used shorter wait-times. These data did not result in the rejection of null hypotheses. The means, standard deviations, and cell sizes for the criterion of length of student response are found in Table 2.

Table 2
Cell Means, Standard Deviations, and Sample Size
for Length of Students' Response Criterion

	WT			NWT			Rows	
	$\bar{x}^{-1}$	S.D.	n	$\bar{x}^{-1}$	S.D.	n	$\bar{x}$	n
HLQ	14.30	8.14	27	4.10	1.56	26	9.30	53
NHLQ	15.56	11.17	24	5.45	3.16	25	10.40	49
Columns	14.89	-	51	4.76	-	51	9.83[2]	102[2]

[1]Response length in seconds.

[2]Grand Mean and Grand Total n.

Hypothesis Two

1. An increase in the total number of alternative student explanations is not related to the amount of use the classroom teacher has made of wait-time (WT) training.

2. An increase in the total number of alternative student explanations is not related to the amount of use the classroom teacher has made of higher level questioning (HLQ) training.

3. There will be no significant interaction between wait-time and higher level questioning (WT+HLQ) training on the criterion of alternative student explanations.

The dependent variable determining the significance of Hypothesis Two was total number of alternative student explanations. Data relevant to this test can be found in Table 3. It was determined for the independent variable of wait-time that no significant effect was found.

The main effect for HLQ was significant, $F(1,17)=12.51$, $p < .05$. The students of teachers who used higher level questions used more alternative student explanations that students of teachers who used fewer HLQs. The means, standard deviations, and cell sizes for the criterion of number of alternative student explanations are found in Table 4.

Table 3
Analysis of Variance Summary for the Criterion:
Number of Alternative Student Explanations

Source	Sums of Squares	Degrees of Freedom	Mean Squares	F
WT	1.19	1	1.19	3.61
HLQ	4.01	1	4.01	12.51*
WT+HLQ	5.57	1	5.57	16.88*
Error	5.58	17	.33	-
Total	16.35	19	-	-

*$p < .05$.

Table 4
Cell Means, Standard Deviations, and Sample Size
for Number of Alternative Student
Explanations Criterion

	WT			NWT			Rows	
	$\bar{x}^1$	S.D.	n	$\bar{x}^1$	S.D.	n	$\bar{x}$	n
HLQ	1.86	.93	27	2.54	.98	26	2.19	53
NHLQ	1.10	.70	24	1.41	1.14	25	1.26	49
Columns	1.50	-	51	1.99	-	51	1.74[2]	102[2]

[1]Explanations per minute.

[2]Grand Mean and Grand Total n.

The WT+HLQ interaction term was significant, $F(1,17)=16.88$, $p < .05$. To determine which of the cell means were significantly different, pair-wise t-tests were run (see Table 5). It was found that the HLQ only group (Cell 2) outscored Cell 4 (control), t (49)=3.80, $p < .05$; the WT only group (Cell 3), t (48)=5.93, $p < .05$, and the WT+HLQ group (Cell 1), t (51)=2.59, $p < .05$. The difference between the WT+HLQ group was significantly different from the WT only group, t (49)=3.26, $p < .05$, in favor of the WT+HLQ group.

Table 5
T-Test for Control and Experimental Groups
Criterion for Alternative Student
Explanations

Cell-to-Cell Comparisons [1]	df	t
Cell 4 vs Cell 2	49	3.801[2]
Cell 4 vs Cell 3	47	1.141
Cell 4 vs Cell 1	50	1.565
Cell 2 vs Cell 3	48	5.934[2]
Cell 2 vs Cell 1	51	2.592[2]
Cell 3 vs Cell 1	49	3.264[2]

[1] See Figure 1 for cell designations.
[2] $p < .05$.

Hypothesis Three

1. There will be no significant differences in the total number of higher level responses for those students taught by teachers trained in wait-time (WT) than for those students taught by teachers without the above training.

2. There will be no significant differences in the total number of higher level responses for those students taught by teachers trained in higher level questioning (HLQ) than for those students taught by teachers without the above training.

3. There will be no significant interaction between wait-time and higher level questioning (WT+HLQ) training on the criterion of higher level student responses.

The dependent variable determining the significance of Hypothesis Three was the total number of higher level student responses. The results showed no significant main effect for wait-time training (see Table 6).

Table 6
Analysis of Variance Summary for the Criterion:
Number of Higher Level Student Responses

Source	Sums of Squares	Degrees of Freedom	Mean Squares	F
WT	.40	1	.40	1.03
HLQ	3.10	1	3.10	7.95*
WT+HLQ	3.56	1	3.56	9.13*
Error	6.59	17	.39	-
Total	13.65	19	-	-

*$p < .05$.

The main effect for HLQ has significant, $F(1,17)=7.95$, $p < .05$. The students of teachers who used higher level questions responded with more higher level responses than students of teachers who used fewer HLQs. The means, standard deviations, and cell sizes for the criterion of number of higher level students responses are also found in Table 6.

The WT+HLQ interaction term was significant, $F(1,17)=9.13$, $p < .05$. To determine which of the cell means (see Table 7) were significantly different, pair-wise t-tests were run. Results are displayed in Table 8.

Table 7
Cell Means, Standard Deviations, and
Sample Size for Total Number
of Higher Level Student
Responses Criterton

	WT			NWT			Rows	
	$\bar{x}^1$	S.D.	n	$\bar{x}^1$	S.D	n	$\bar{x}$	n
HLQ	2.29	.99	27	2.63	1.09	26	2.46	53
NHLQ	1.46	.85	24	1.68	1.12	25	1.57	49
Columns	1.90	-	51	2.16	-	51	2.03[2]	102[2]

[1]Responses per minute.

[2]Grand Mean and Grand Total n.

Table 8
T-Test for Control and Experimental Groups
Criterion for Higher Level
Student Responses

Cell-to-Cell Comparisons[1]	df	t
Cell 4 vs Cell 2	49	3.070[2]
Cell 4 vs Cell 3	47	0.772
Cell 4 vs Cell 1	50	2.084[2]
Cell 2 vs Cell 3	48	4.208[2]
Cell 2 vs Cell 1	51	1.190
Cell 3 vs Cell 1	49	3.192[2]

[1]See Figure 1 for cell designations.

[2]$p < .05$.

It was found that the HLQ only group (Cell 2) outscored Cell 4 (controls) t (49)=3.07, p <.05, and outscored the WT only group (Cell 3), t (48)=4.21, p <.05. The WT+HLQ group (Cell 1) outscored Cell 4 (controls), t (50)=2.08, p <.05 and the WT only group (Cell 3), t (49)=3.19, p <.05.

Hypothesis Four

1. An increase in the total number of higher level questions asked by the teachers is not related to the amount of use the teacher has made of wait-time (WT) training.

2. An increase in the total number of higher level questions asked by teachers is not related to the amount of use the teacher has made of higher level questioning (HLQ) training.

3. There will be no significant interaction between wait-time and higher level questioning (WT+HLQ) training on the criterion of higher level teacher questions.

The dependent variable examined in Hypothesis Four was the total number of higher level teacher questions. Both treatments and the interaction effect were significant for the criterion higher level teacher questions (see Table 9) with the following F scores, respectively: $F(1,17)=21$, p <.05; $F(1,17)=22$, p <.05; and $F(1,17)=75$, p <.05. The teachers in the above treatment groups used higher level questions to a greater degree than teachers who were not trained in one of the treatment groups. The means, standard deviations, and cell sizes for the criterion of number of high level teacher questions are found in Table 10.

To determine which of the cell means were significantly different, pair-wise t-tests were run and are displayed in Table 11. It was found that HLQ only group (Cell 2) outscored Cell 4 (controls), t (49)=5.49, p <.05, the WT only group (Cell 3), t (48)=4.86, p <.05, and the WT+HLQ group (Cell 1), t (51)=6.00, p <.05.

Table 9
Analysis of Variance Summary for the Criterion:
Higher Level Teacher Questions

Source	Sums of Squares	Degrees of Freedom	Mean Squares	F
WT	1.05	1	1.05	21.00*
HLQ	1.11	1	1.11	22.20*
WT+HLQ	3.75	1	3.75	75.00*
Error	.89	17	.05	-
Total	6.80	19	-	-

*$p < .05$.

Table 10
Cell Means, Standard Deviations, and
Sample Size for Number of Higher
Level Teacher Questions

	WT			NWT			Rows	
	$\bar{x}^1$	S.D.	n	$\bar{x}^1$	S.D.	n	$\bar{x}$	n
HLQ	.76	.39	27	1.71	.72	26	1.23	53
NHLQ	.80	.59	24	.70	.46	25	.75	49
Columns	.78	-	51	1.21	-	51	.99[2]	102[2]

[1] Questions per minute.

[2] Grand Mean and Grand Total n.

Table 11
T-Test for Control and Experimental Groups
Criterion for Higher Level
Teacher Questions

Cell-to-Cell Comparisons[1]	df	t
Cell 4 vs Cell 2	49	5.943[2]
Cell 4 vs Cell 3	47	0.663
Cell 4 vs Cell 1	50	0.509
Cell 2 vs Cell 3	48	4.864[2]
Cell 2 vs Cell 1	51	6.004[2]
Cell 3 vs Cell 1	49	0.289

[1]See Figure 1 for cell designations.

[2]$p < .05$.

Hypothesis Five

1. There will be no significant differences in the total number of questions asked by teachers trained in the use of wait-time (WT) and by teachers in the control group.
2. There will be no significant differences in the total number of questions asked by teachers trained in the use of higher level questioning (HLQ) and by teachers in the control group.
3. There will be no significant interaction between wait-time and higher level questioning (WT+HLQ) training on the criterion of teacher questions.

The dependent variable used to examine Hypothesis Five was the total number of teacher questions.

The independent variable of wait-time, and wait-time and higher level questioning the effects were determined to be significant at the .05 level as indicated in Table 12.

Table 12
Analysis of Variance Summary for the Criterion:
Total Teacher Questions

Source	Sums of Squares	Degrees of Freedom	Mean Squares	F
WT	5.48	1	-	19.57*
HLQ	.07	1	5.48	.25
WT+HLQ	5.61	1	.07	20.04*
Error	4.79	17	5.61	-
Total	15.95	19	.28	-

*$p < .05$.

The main effect for WT was significant, $F(1,17)=19.57$, $p < .05$. Teachers trained in the use of wait-time asked fewer questions overall than teachers not trained. The means, standard deviations, and cell sizes for the criterion of total teacher questions are found in Table 13.

The control group (Cell 4) outscored both WT only group (Cell 3), t (47)=3.09, $p < .05$, and WT+HLQ group (Cell 1), t (50)=4.26, $p < .05$. Similar outcomes were found as the HLQ only group (Cell 2) outscored both the WT only group (Cell 3), t (48), 3.96, $p < .05$, and WT+HLQ group (Cell 1), and t (51)= 6.30, $p < .05$ as indicated in Table 14.

Hypothesis Six

1. There will be no significant differences in the total number of disciplinary moves made by teachers trained in the use of wait-time (WT) and by teachers in the control group.

2. There will be no significant differences in the total number of disciplinary moves made by teachers trained in the use of higher level questioning (HLQ) and by teachers in the control group.

Table 13
Cell Means, Standard Deviations, and
Sample Size for Total Number
of Teachers Questions

	WT			NWT			Rows	
	$\bar{x}^1$	S.D.	n	$\bar{x}^1$	S.D.	n	$\bar{x}$	n
HLQ	1.02	.50	27	2.09	.72	26	1.54	53
NHLQ	1.21	.85	24	2.22	1.37	25	1.72	49
Columns	1.11	-	51	2.15	-	51	1.63[2]	102[2]

[1]Questions per minute.

[2]Grand Mean and Grand Total n.

Table 14
T-Test for Control and Experimental Groups Criterion:
Total Teacher Questions

Cell-to-Cell Comparisons[1]	df	t
Cell 4 vs Cell 2	49	0.427
Cell 4 vs Cell 3	47	3.086*
Cell 4 vs Cell 1	50	4.258*
Cell 2 vs Cell 3	48	3.960*
Cell 2 vs Cell 1	51	6.304*
Cell 3 vs Cell 1	49	0.986

*p <.05 level of significance.

3. There will be no significant interaction between wait-time and higher level questioning (WT+HLQ) training on the criterion of disciplinary teacher moves.

The data produced was not sufficient to warrant statistical analysis.

Summary

The mixed findings of the study indicate that in the subject area of language arts, no one training procedure is able to provide the same outcomes as Row found in the subject area of science with wait-time training alone.

The teachers trained in wait-time techniques, compared with those not trained, had longer student responses, asked more higher level questions, but asked fewer total questions. No differences were observed in either the number of higher level student responses.

A somewhat complementary pattern was observed for HLQ training. Those trained experienced greater numbers of alternative student explanations and more higher level student responses. As predicted, the training resulted in more HLQs asked by teachers. On the other hand, HLQ training did not affect either the length of student response or the total number of questions asked by teachers.

It seems apparent that to meet the goals inherent in the first four criteria hypothosized, both treatments in combination are effective. Neither, however, was successful in increasing the total number of teacher questions.

Relative to the total number of teacher questions, it is useful to examine the interactions of WT and HLQ. The control group was more successful than either WT only or the combined groups. It would appear that something about these training sessions depressed the use of all questions. The HLQ only was superior to either the combination training or the WT training only.

In terms of the five criteria, the most promising interactions occurred in favor of HLQ only over WT only (in four of the five criteria). HLQ training was superior to the combination training in three of five criteria and was also better than the control in three of the five criteria.

Conversely, the combination training was better than WT only on two of the five criteria and better than no training in two criteria.

Overall, it appears that if one is faced with the choice between HLQ and WT training, these results suggest the former. A combination has some added dimension to offer, however.

Additional Observations

In addition to the statistical findings noted previously, several noteworthy nonstatistical observations were obtained from the ten live coded follow-up discussions. It was found that the live coding and the taped coding provided the following information.

1. The classes where the teacher was dominant through the use of the rapid-fire question/answer syndrome were difficult to live code accurately.

2. The classes where the teachers used wait-time, the live as well as taped coding allowed,without any difficulty, the recording of the pauses (wait-time I and II) and the level of verbal interactions.

3. The classes where the teachers trained in wait-time, utilized the facilitative teacher behaviors, the live coding allowed the researcher to record the nonverbal facilitative teacher behaviors. These facilitative teacher behaviors included: (a) remaining at eye level with the class by sitting down within the class group; (b) avoiding eye contact with the students during their responses; and (c) employing a relaxed manner while pausing for wait-time I and II.

The relaxed manner seemed to indicate that the teacher knew that the pause had a purpose and therefore was an acceptable instructional strategy. As a

result of the live coding, it was noted that the interactions of the facilitative teacher behaviors with the combined wait-time and questioning treatment and with the wait-time treatment alone, resulted in positive student outcomes for both treatments. However, the fact remains that there are no statistical data to validate these observations. This is an area of study in which research has not been directed in the past, but in which research needs to be directed in the future in order for its effects to be recognized within Rowe's wait-time theory. Even Rowe's research did not fully explore the statistical effects of the behavior guide. Yet, research has shown a less authoritative, more facilitative classroom climate aids the learning process (Withall, 1949; Mitzel & Rabinowitz, 1953; Flanders, 1967). Although teachers were trained in both wait-time and facilitative teacher behaviors for this study, a statistical analysis was not performed due to the lack of available video taping equipment to record those behaviors which require visual observation.

Implications

Since the study involved training teachers in three treatments, the results of the study have implications for teacher education programs in the language arts methods course. The following recommendations would be indicated from the nature of this study and the findings.

1. Language arts textbooks need to focus their attention on presenting to preservice teachers the theories and strategies expected of them in the areas of wait-time, questioning, and listening.

2. Within the language arts methods course in the teacher education program, the strategies of Rowe's wait-time theory should be considered in depth with application in the specific areas within the language arts.

3. Within the language arts course in the teacher education program, specific listening skills for teachers should be covered with particular emphasis on reflective listening skills.

Research needs to be conducted to determine whether the behaviors exhibited by teachers given specific training in Rowe's wait-time theory and questioning strategies, which resulted in heightened student participation, can be replicated within the framework of teacher training programs such as in a methods/practicum course in an elementary education curriculum.

Longitudinal research needs to be designed to study whether the effects of the wait-time and questioning training are being sustained in the classroom or whether teachers quickly fall back into old patterns. The research of Szabo and Welliver (1978) suggests regression may be the case in certain observed teacher behaviors. The results of such a study would help to determine at what point the strategies were becoming debilitated and when a refresher could should be initiated to return the teachers to their previous levels of achievement.

The results of this study support Gall (1970) and Ryan's (1973, 1974) conclusions on questioning research; that is, that research needs to address itself not only to the effects of a variety of questions, but also to the other numerous variables that comprise the learning situation. Wait-time would certainly fall into this variable category. Further studies devoted to Rowe's wait-time theory should be combined with questioning strategies. This combined research would allow teachers and students to benefit from the body of research information gathered on both strategies. Research needs to be conducted to determine how much wait-time is beneficial for low level questioning versus higher level questioning.

The combined research needs to be addressed to the issue of whether females or males in the class are given more wait-time and higher level questions from their teacher. This type of research could then be added to the growing body of data on sex bias treatment in our education system. The recognition of either of these strategies being used more with one group of students than another might then lead to remediation efforts to eliminate the biased treatment.

One group of educational theorists argues for generalized theories with power to explain a variety of phenomena. The replication and extension of the work of Rowe and others into the region of language arts (from science) appears to lend a modest credence to the search for generalizable theories of education. Only a few stones have been lifted: many more will be examined before the results are in.

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